

Scalable Gravity Offload System, Phase II

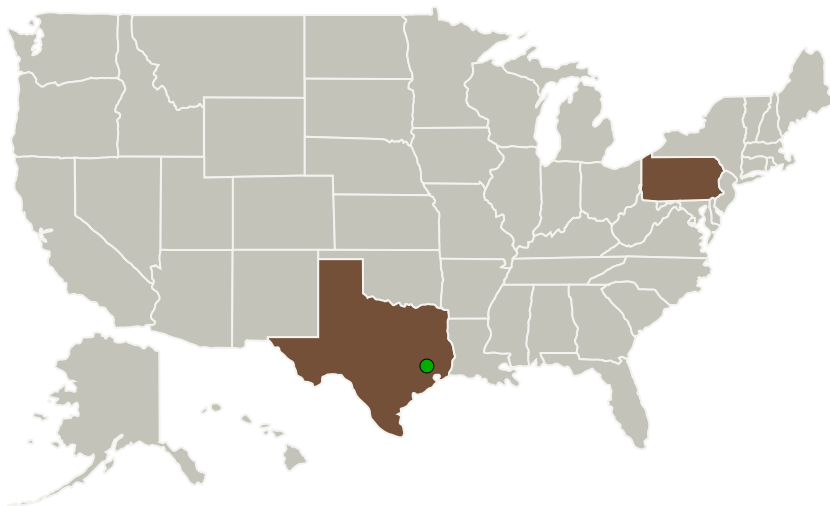
Completed Technology Project (2011 - 2013)



Project Introduction

A scalable gravity offload device simulates reduced gravity for the testing of various surface system elements such as mobile robots, excavators, habitats, and deployables in a relevant environment. The device is capable of simulating reduced gravity over an arbitrary terrain including such features as slopes, obstacles, and varying surface concavity. The device consists of a linear movement system, a 2 degree-of-freedom manipulator, a passive force application mechanism, and a position tracking mechanism. The manipulator travels along the linear movement system and is positioned perpendicular to the linear movement system's direction of travel. The result is a rectangular working area whereby the gravity offload device can simulate reduced gravity in the area defined by the length of the linear movement system by the width (reach) of the 2 degree-of-freedom manipulator. The force application mechanism is principled upon precision maintenance of a pressure in an air cylinder. Precision regulation of supply pressure enables constant force over the throw of the air cylinder. Varying the regulator supply pressure to the air cylinder(s) modifies the force experienced by the test article and therefore enables a gravity offload device to simulate a range of gravity fields proportional to the ability to regulate pressure.

Primary U.S. Work Locations and Key Partners



Scalable Gravity Offload System, Phase II

Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	3
Technology Areas	3
Target Destinations	3

Scalable Gravity Offload System, Phase II

Completed Technology Project (2011 - 2013)



Organizations Performing Work	Role	Type	Location
Astrobotic Technology, Inc.	Lead Organization	Industry	Pittsburgh, Pennsylvania
Carnegie Mellon University	Supporting Organization	Academia	Pittsburgh, Pennsylvania
● Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations

Pennsylvania

Texas

Project Transitions

**July 2011:** Project Start**September 2013:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/139308>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Astrobotic Technology, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

William Whittaker

Co-Investigator:

William Whittaker

Scalable Gravity Offload System, Phase II

Completed Technology Project (2011 - 2013)



Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX13 Ground, Test, and Surface Systems
 - └ TX13.4 Mission Success Technologies
 - └ TX13.4.6 Ground Analogs for Space/Surface Systems

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System